90-01621 Gypsum, anhydrite potential, Meadows Road area, Cape Breton County (N.S.)

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GYPSUM, ANHYDRITE POTENTIAL, MEADOWS ROAD AREA, CAPE BRETON COUNTY

by

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Nova Scotia Department of Mines and Energy

November 1988

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GYPSUM, ANHYDRITE POTENTIAL, MEADOWS ROAD AREA, CAPE BRETON COUNTY

G. Adams

INTRODUCTION

The Meadows Road gypsum and anhydrite area is located 12 km southwest of Sydney, Cape Breton County (reference map 11K/01B). This investigation was completed in the area from Portage, Cape Breton County in the northwest to the Woodbine Road in the southeast (Fig. 1) and will be referred to as the Meadows Road area.

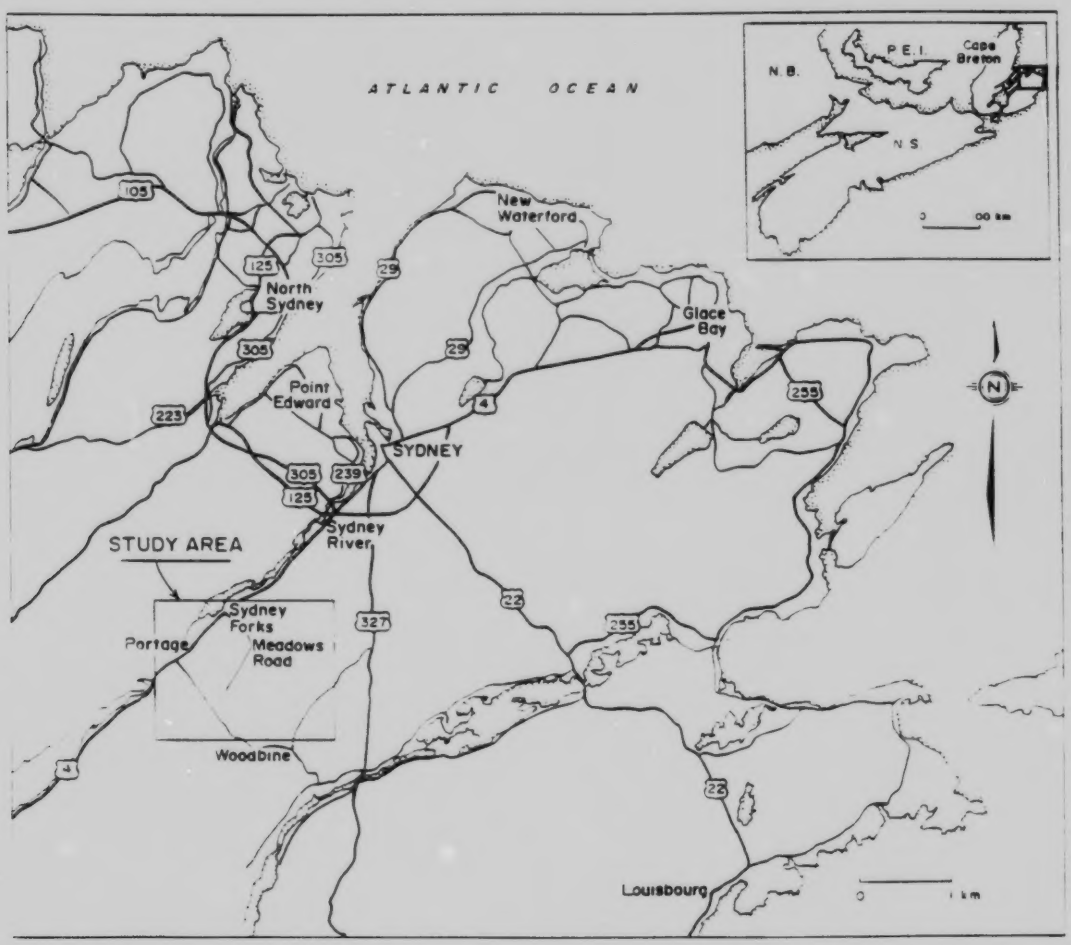

Figure 1. Location map of the Meadows Road area, Cape Breton County.

Limited diamond drilling carried out in this area by Morton Chemicals while exploring for salt in 1961 and 1962 (Morton Nos. 1-3) and by the Nova Scotia Department of Mines and Energy in 1984 (WR-84-1-2) encountered gently dipping interbedded evaporites, carbonates and clastics of the Early Carboniferous Lower Windsor Group. Included in this sequence are gypsum and anhydrite beds which might be amenable to underground mining.

During the summer of 1986 the Nova Scotia Department of Mines and Energy completed a small diamond drilling program consisting of eight drillholes totalling 647 m (MR-86-1-MR-86-8). This program attempted to establish the downdip and lateral extent of the gypsum and anhydrite beds.

GENERAL GEOLOGY

Boehner and Giles (1986) mapped the Meadows Road area as part of their Sydney Basin map area. They described the geology as consisting mainly of interbedded evaporites, carbonates and clastics of the Windsor Group MacBeth Brook, Sydney River, Meadows Road and Woodbine Road Formations.

These units are underlain to the southwest by clastics of the Horton Group and overlain to the northeast by interbedded clastics, carbonates and coals of the Morien Group. The area is fault-bound to the northwest by the East Bay Fault and to the southeast by the Big Pond Fault (Fig. 2).

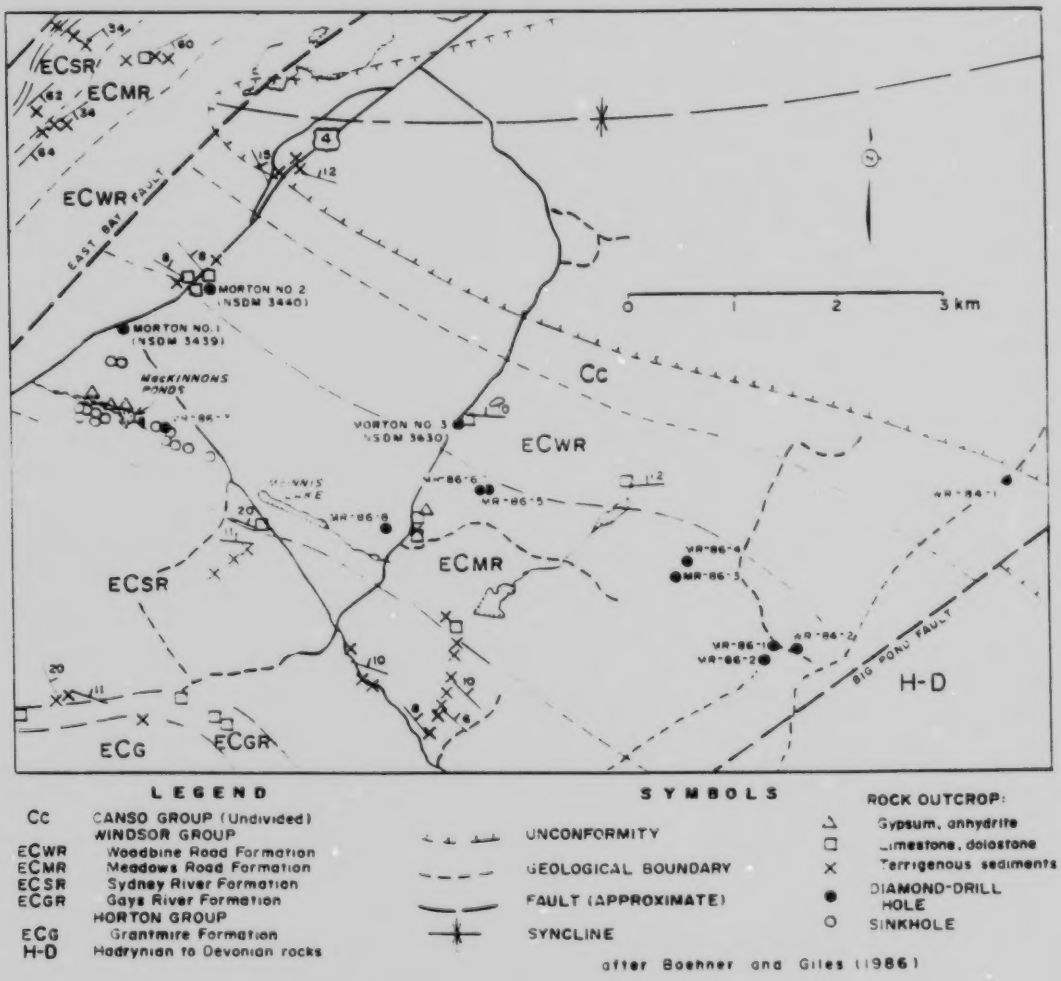

Figure 2. Geology map with diamond drillhole locations.

In the Meadows Road area, Windsor Group sedimentary rocks dip gently to the northeast at 8°-10° into the Sydney Basin. The units of primary interest in this survey belong to the Meadows Road Formation (Boehner and Giles, 1986) which belongs to Cycle 2 (B subzone) of the Windsor Group.

DRILLING PROGRAM

Between July 10 and September 11, 1986 a Longyear 38 wireline diamond drill was used to carry out the drilling program consisting of 8 drillholes totalling 647 m. Drill rods of BQ size were used to recover core 1 7/16 inches in diameter. Core was logged either at the time of drilling at the sites or at a later date in Stellarton at the core library of the Nova Scotia Department of Mines and Energy where it is presently stored (Appendix 1).

Representative samples of gypsum and anhydrite intervals were taken by splitting the core. These samples were sent to the Minerals Engineering Centre at the Technical University of Nova Scotia, Halifax for analyses.

ANALYSES

Samples submitted for analyses were air dried, pulverized and tested for moisture, combined water, SO_3 and NaCl. The percentages of gypsum and anhydrite were then calculated (Appendix 1). The NaCl content was determined because of its deleterious effects in the gypsum wallboard manufacturing process.

DISCUSSION OF RESULTS

Stratigraphic Interpretation

Geological mapping of Meadows Road by Boehner and Giles (1986) found no surface outcrops of the Meadows Road Formation. Stratigraphic interpretations of the area have been made by Bell (1961) and Boehner (personal communication) using Morton Chemicals salt exploration drillholes (Morton Nos. 1-3) drilled in 1961-62 as well as Nova Scotia Department Mines and Energy drillholes WR-84-1 and WR-84-2. Two limestone units, the Hydro (Forgeron, 1977) and the B_2 (Boehner, personal communication) can be traced from the Morton holes in the northwest to the Woodbine Road holes in the southeast.

Two prominent geomorphologicial features present in this area are MacKinnons Ponds and McInnis Lake. These probably represent the dissolution of sulphate beds in the subcrop and therefore reflect the strike of the strata in the area. Similar trench-like features (Fig. 3) have been noted in many areas underlain by the Windsor Group throughout the Province. Azimuths of this chain of lakes (108°-114°) correspond closely to those taken from clastic outcroppings of the underlying Sydney River Formation a short distance to the southwest.

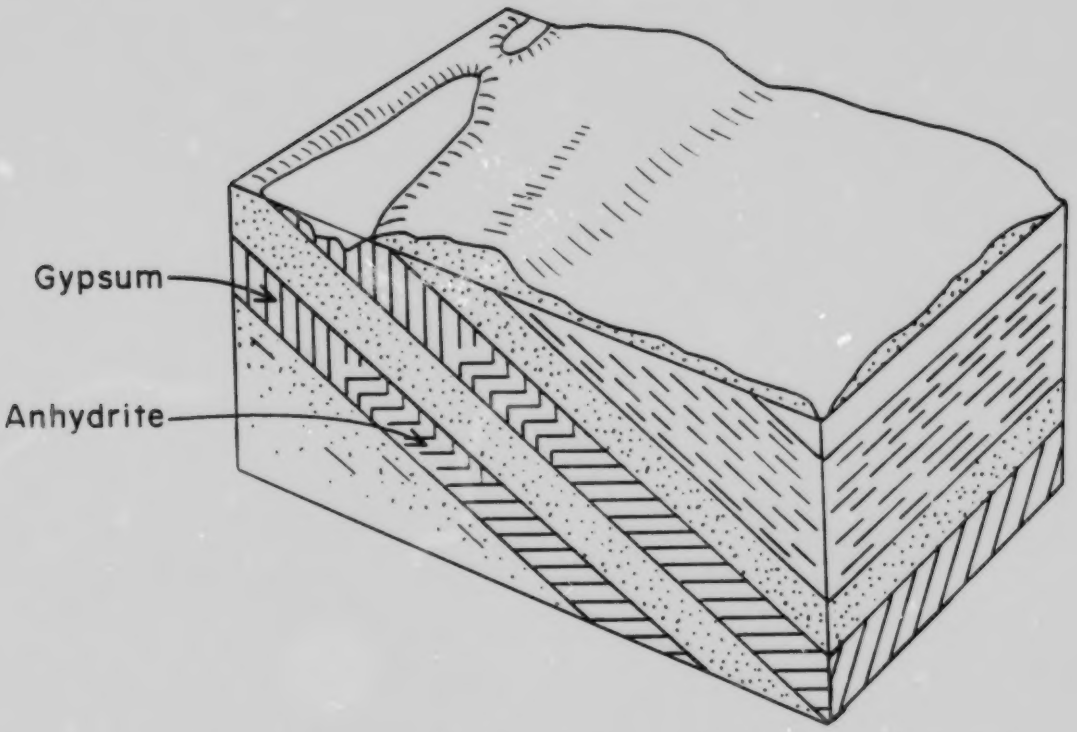

Figure 3. Surficial features reflect dissolution of sulphate horizons.

In the southeastern portion of the study area it was found that holes MR-86-1 and MR-86-2 correlate well with WR-84-2 (Fig. 4). Using the top of the Hydro limestone as a reference plane, it was possible to construct a three-point diagram which determined the attitude of the bed to be 104°/8° NE. Lithologies correlate well between all three holes. MR-86-2, MR-86-4 and WR-84-2 were also correlated using the top of the Hydro limestone bed. The attitude determined using these holes was 166°/5° NE. The discrepancy between this value and those previously determined could be explained by the presence of some minor structure between the areas of drillholes MR-86-1 and MR-86-2, and MR-86-3 and MR-86-4 (Fig. 5).

Unfortunately, holes MR-86-5 and MR-86-6 never reached bedrock. They were drilled to depths of 38.71 m and 44.81 m respectively into what appears to be a paleosolution feature in the vicinity of the Sydney River. Both holes were abandoned in overburden which consisted of clay. Both MR-86-7 and MR-86-8 were correlated to Morton No. 1 by using sulphate horizons in addition to limestone (Fig. 6). Although these relationships were slightly more tenuous than in the other areas the attitude produced by a three-point diagram, 124°/7° NE, is close to that taken from the topographic features of the area.

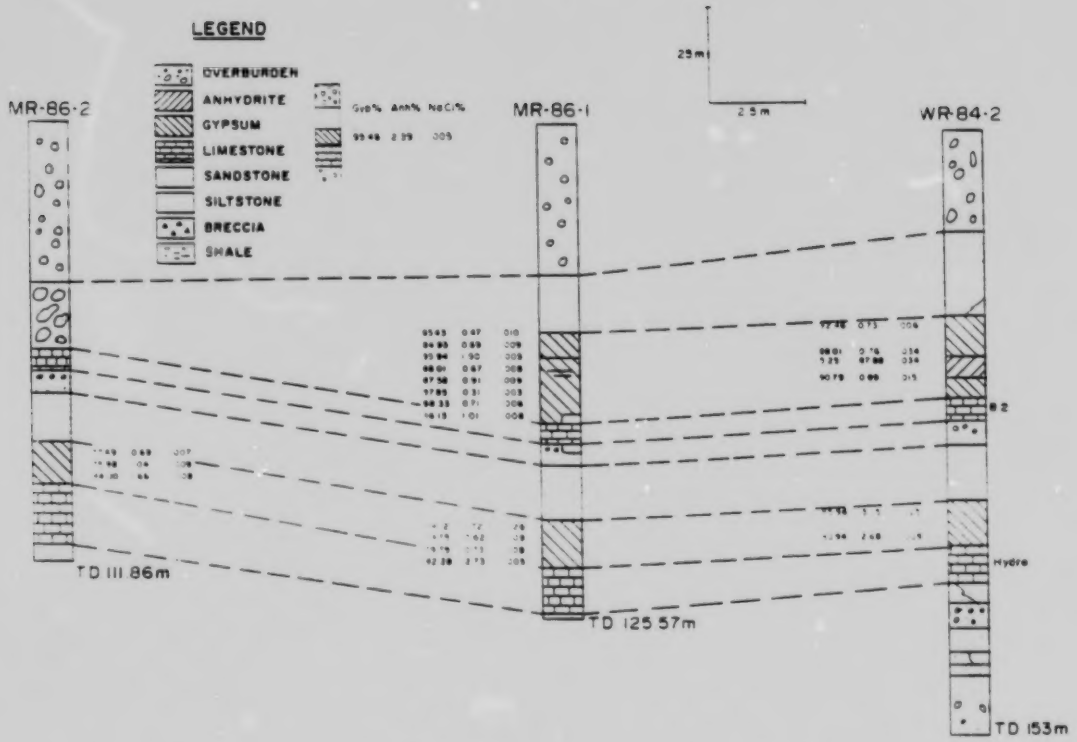

Figure 4. Correlation diagram MR-86-2, MR-86-1 and WR-84-2.

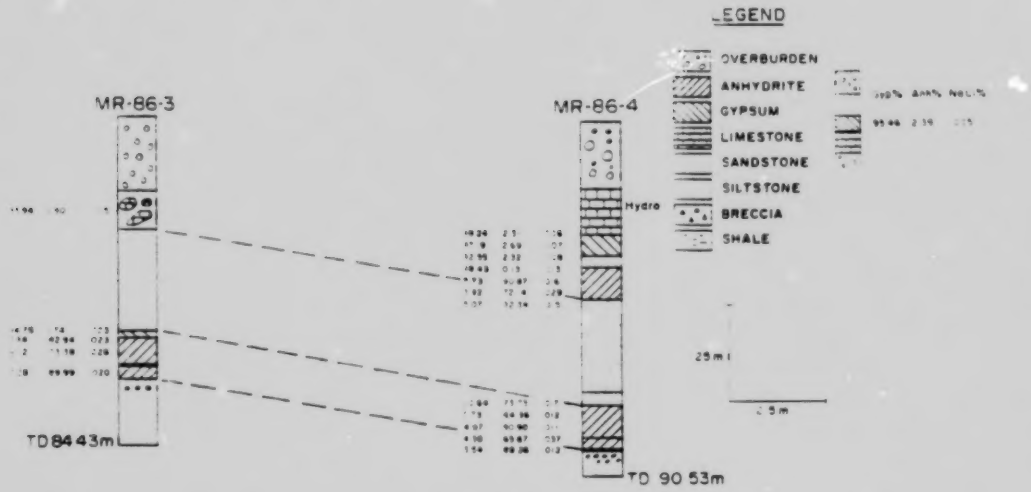

Figure 5. Correlation diagram MR-86-3 and MR-86-4.

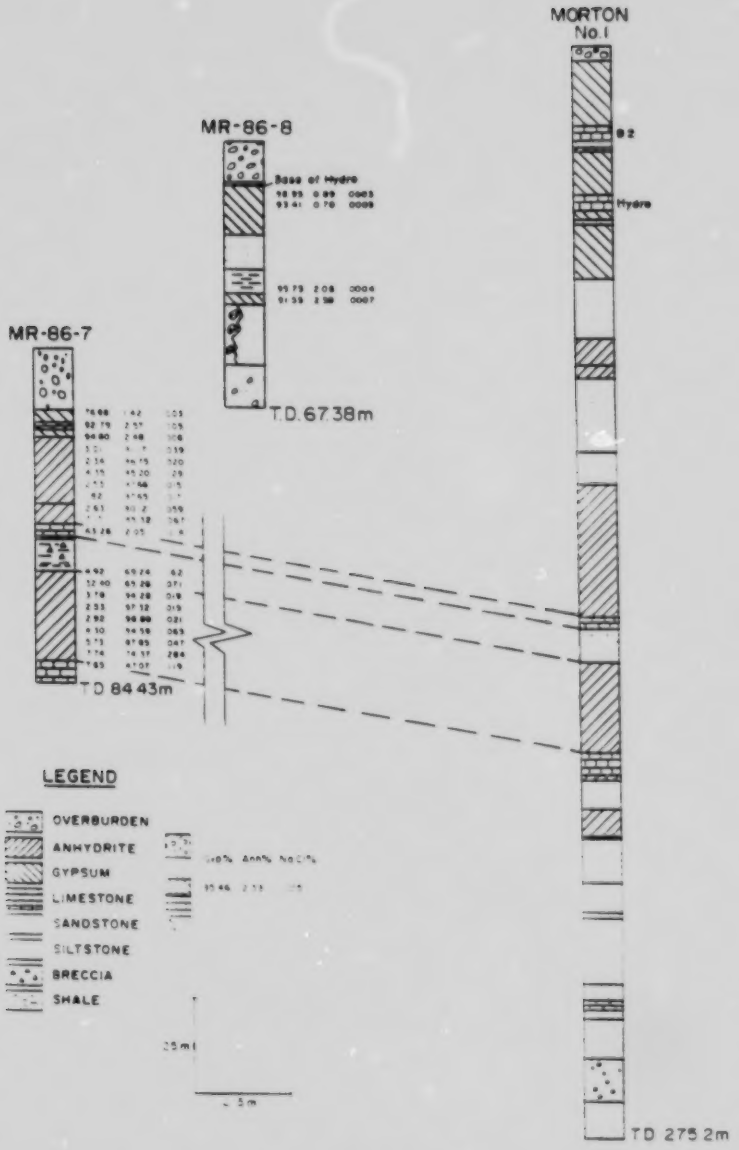

Figure 6. Correlation diagram MR-86-7, MR-86-8 and Morton No. 1.

Sulphate Horizons

Gypsum units in the Meadows Road area appear to be the result of hydration of anhydrite beds by surface waters. Generally, this hydration only extends to about 30 m below sea level, although some gypsum is found on the contacts of deeper anhydrite beds where they are adjacent to porous interbeds. Units up to 10 m in thickness were encountered which can be traced over 250 m downdip.

In the southeastern portion of the area the two gypsum units encountered consist of dense, white, fine grained gypsum with varying amounts of interstitial dolomite. The upper bed grades from 85-98% gypsum and the lower bed grades from 79-85% gypsum. Minor anhydrite (up to 30%) makes up most of the additional impurity besides the dolomite. The only anhydrite unit seen in this area was encountered in MR-84-2 in the middle of the uppermost sulphate horizon which has not yet hydrated. A sample yielded 88% anhydrite and 5% gypsum with minor interstitial dolomite.

The northwestern portion of the study area also yielded good sulphate horizons traceable between holes. Good gypsum units in Morton No. 1 described by Bell (1961) were not sampled owing to the disturbed nature of the core. One 12 m thick unit from MR-86-8, which correlated with Morton No. 1 approximately 3000 m away along strike, yielded analyses in the middle to high 90% range for gypsum with minor interstitial dolomite and anhydrite.

Thick (+20 m) beds of high purity anhydrite are found below the hydration zone. Units encountered in MR-86-7 which have 85-95% anhydrite can be correlated to similar units found in Morton Chemicals' hole No. 1.

CONCLUSIONS AND RECOMMENDATIONS

The limited drilling program carried out in the Meadows Road area during summer 1986 determined the following factors: (a) sulphate horizons within the Meadows Road Formation can be correlated both downdip and along strike, (b) both gypsum and anhydrite beds of high purity and significant thickness were encountered, and (c) gentle dips of the strata in the Meadows Road area would be amenable to underground mining methods.

Additional work is necessary to define reserves of gypsum or anhydrite in the area. The most promising situation is in the northwestern portion of the Meadows Road area where good quality gypsum horizons encountered in Morton No. 1 were also found in MR-86-8. High purity anhydrite beds are found closest to surface in the MR-86-7. They correlate well with beds intersected in Morton No. 1 which suggests that large tonnages of high quality anhydrite could be readily accessible from this area.

Although good gypsum beds were found in the southeastern portion of the study area the thick overburden conditions found there have to be taken into consideration. Perhaps this overburden could be marketed as aggregate material, if not it would greatly increase the cost of developing a decline down to the underlying gypsum.

The area around the present Sydney River valley should be avoided due to extensive dissolution of the sulphate beds.

REFERENCES

Bell, W. A.
1961: Report on evaporite deposits in the Sydney Forks District, Sydney area, Nova Scotia; in Report on drilling for evaporites in the Sydney Forks area of Cape Breton, Nova Scotia, Canada; Nova Scotia Department of Mines and Energy Assessment Report 11K/01B 40-C-90(01)

Boehner, R. C. and Giles, P. S.
1986: Geological map of the Sydney Basin, Cape Breton Island, Nova Scotia; Nova Scotia Department of Mines and Energy, Map 86-1, scale 1:50 000

Forgerson, S.
1977: The Kaiser Celestite mining operation and mineral potential of the Loch Lomond Basin, Cape Breton, Nova Scotia; Nova Scotia Department of Mines and Energy, Open File Report 328.

APPENDIX

Diamond Drill Logs

NOVA SCOTIA DEPARTMENT OF MINES AND ENERGY
DIAMOND DRILL RECORD

PROPERTY: **Meadows Road** HOLE NO. MR-86-1

Latitude	Departure	Elevation	Section
46 deg. 0 min. 38.87 sec.	60 deg. 15 min. 44.86 sec.	82.946 m	From: 0 m To: 64.28 m

Datum	Bearing	Dip 90°	Started (date)	Completed (date)	Ultimate Depth	Proposed Depth
			July 10, 1986	July 23, 1986	125.27 m	

Depth in Metres	FORMATION	Sample Number	Sample Interval	ASSAY VALUES %Gyp	%Anhy	%NaCl
0-38.71	Overburden, granitic and metamorphic clasts, mud above					
	contact.					
38.71-53.25	Siltstone, moderate to dark reddish brown mottled					
	greenish grey in part; sandy near top decreases; blocky					
	to rubbly in mid unit to base with mud-filled cavities					
	in lower portion. Contact rubbly and uncertain.					
53.25-59.80	Gypsum, white, massive to nodular mosaic with varying	R-1008	53.69-53.95	85.43	0.47	0.010
	amounts of interstitial dolomite possible minor por-	R-1009	57.23-57.53	84.95	0.69	0.009
	tions of anhydrite. Grade +80%. Contact is erosional.					
59.80-60.02	?Hemihydrate - light grey, very fine grained, dense,	R-1010	60.93-61.16	95.94	1.50	0.005
	minor fine grained gypsum-filled fractures. Contact is					
	erosional.					
60.02-62.64	Gypsum, white, fine grained, massive to nodular mosaic,	R-1011	62.65-62.89	88.01	0.67	0.008
	minor interstitial dolomite. Grade +85%. Contact					
	erosional.					
62.64-62.88	?Hemihydrate as above. Contact erosional.					
62.88-63.79	Gypsum, white massive as above.					
63.79-64.01	?Hemihydrate as above.					
64.01-64.28	Gypsum, white massive as above.					

Drilling Performed By Nova Scotia Department of Mines & Energy
Agency

Signature Gordon C. Adams
Geologist

NOVA SCOTIA DEPARTMENT OF MINES AND ENERGY
DIAMOND DRILL RECORD

PROPERTY: **Meadows Road** HOLE NO. M6-86-1

Latitude	Departure	Elevation	Section From: 64.28 m	To: 92.42 m
Datum	Bearing	Dip 90°	Started (date) July 10, 1986	Completed (date) July 23, 1986	Ultimate Depth 125.27 m	Proposed Depth

Depth in Metres	FORMATION	Sample Number	Sample Interval	ASSAY VALUES %Gyp	%Anhy	%NaCl
64.28-64.50	?Hemihydrate as above with 3 cm mud filled cavity at					
	base. Contact erosional.					
64.50-65.32	Gypsum, white massive, vuggy in mid unit with selenitic					
	gypsum in vugs. Contact erosional.					
65.32-65.59	?Hemihydrate as above. Contact erosional.					
65.59-76.20	Gypsum, white, fine grained, nodular mosaic to massive	R-1012	64.59-64.80	87.58	0.91	0.009
	1.5 m core missing around 75.29 m, probable solution	R-1013	67.19-67.44	97.85	0.13	0.003
	cavity at basal contact. Few minor dolomitic inter-	R-1014	70.74-71.02	98.33	0.17	0.006
	laminae base. Contact erosional.	R-1015	73.53-73.76	96.13	1.01	0.006
76.20-81.38	Limestone, medium to dark grey, massive to rubbly,					
	highly calcareous abundant brachiopod fossils, sandy at					
	base. Contact ?.					
81.38-84.43	Core missing.					
84.43-86.47	Sandstone, medium to light grey, conglomeratic at top,					
	calcareous at top grades to siltstone below, colour					
	grades to red. Contact gradational.					
86.47-92.42	Siltstone, dark reddish brown, sandy at top, minor satin					
	spar filled fractures parallel to bedding 80°-85° to					
	core axis. Contact erosional.					

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NOVA SCOTIA DEPARTMENT OF MINES AND ENERGY
DIAMOND DRILL RECORD

PROPERTY: Meadows Road HOLE NO. MR-86-1

Latitude	Departure	Elevation	Section From: 92.42 m To: 125.27 m
Datum	Bearing / Dip 90°	Started (date) July 10, 1986	Completed (date) July 23, 1986 / Ultimate Depth 125.27 m / Proposed Depth

Depth in Metres	FORMATION	Sample Number	Sample Interval	ASSAY VALUES %Gyp	%Anhy	%NaCl
92.42-93.67	Siltstone, light greyish green, minor satin spar-filled					
	fractures. Contact gradational.					
93.67-100.10	Siltstone, dark reddish brown same as above. Contact	R-1016	101.15-101.47	79.12	1.72	0.026
	erosional.					
100.10-112.38	Gypsum, white to light grey, massive to nodular at base,	R-1017	104.44-104.80	79.75	0.67	0.009
	increasing interstitial limestone towards base. Grades	R-1018	107.52-107.87	79.75	0.73	0.008
	85% at top, 50% at base. Contact gradational.	R-1019	111.40-111.68	82.28	2.74	0.005
112.38-124.05	Limestone, light brown at top grades to medium to dark					
	grey at base, variably calcareous and fossiliferous,					
	massive to 121.62 m blocky below, rubbly contact.					
124.05-125.27	Siltstone, medium reddish brown, sandy in part, blocky					
	with some core missing.					
	End of Hole.					

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NOVA SCOTIA DEPARTMENT OF MINES AND ENERGY
DIAMOND DRILL RECORD

PROPERTY: **Meadows Road** HOLE NO. MR-86-2

Latitude	Departure	Elevation	Section
46 Deg. 0 Min. 35.11 Sec.	60 Deg. 15 Min. 48.52 Sec.	84.086 cm	From: 0 m To: 107.29 m

Datum	Bearing	Dip 90°	Started (date) July 24, 1986	Completed (date) July 31, 1986	Ultimate Depth 111.86 m	Proposed Depth

Depth in Metres	FORMATION	Sample Number	Sample Interval	ASSAY VALUES %Gyp	%Anhy	%NaCl
0-41.76	Overburden.					
41.76-58.45	Siltstone, dark reddish brown, slumped material with					
	abundant red clay infilling, rubbly at base.					
58.45-63.40	Limestone, medium to dark grey calcareous vuggy at top,					
	very fossiliferous, +1.5 m core missing, rubbly in part.					
	Contact gradational.					
63.40-69.19	Conglomerate, grades to sandstone, calcareous at top,					
	light grey grades to red, +1.5 m core missing. Contact					
	gradational.					
69.19-81.69	Siltstone, dark reddish brown, minor grey clay inter-					
	beds, laminae 80° to core axis. Contact erosional.					
81.69-92.42	Gypsum, white to light grey, nodular with abundant	R-1005	81.76-82.37	77.69	0.69	0.007
	interstitial limestone and dolomite (base), abundant	R-1006	85.28-85.55	75.88	1.04	0.009
	selenite towards base, 3 cm satin spar veinlet at base.	R-1007	91.64-91.95	84.00	1.66	0.008
	Contact erosional.					
92.42-107.29	Limestone, light brown at top, medium to dark grey					
	below, dolomitic at top to calcareous at bottom, lower					
	half blocky to rubbly with much core missing mud filled					
	cavity at base.					

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NOVA SCOTIA DEPARTMENT OF MINES AND ENERGY
DIAMOND DRILL RECORD

PROPERTY: **Meadows Road** HOLE NO. MR-86-2

Latitude	Departure	Elevation	Section From: 107.29 m To: 111.86 m
Datum	Bearing	Dip 90°	Started (date) July 24, 1986 / Completed (date) July 31, 1986 / Ultimate Depth 111.86 m / Proposed Depth

Depth in Metres	FORMATION	Sample Number	Sample Interval	ASSAY VALUES %Gyp	%Anhy	%NaCl
107.29-111.86	Siltstone, reddish brown, in part conglomeratic mostly					
	missing.					
	End of Hole.					

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DIAMOND DRILL RECORD

PROPERTY: **Meadows Road** HOLE NO. MR-86-3

Latitude	Departure	Elevation	Section
46 Deg. 10 Min. 2.04 Sec.	60 Deg. 16 Min. 26.72 Sec.	48.426 m	From: 0 m To: 84.43 m

Datum	Bearing	Dip 90°	Started (date) August 1, 1986	Completed (date) August 12, 1986	Ultimate Depth 84.43 m	Proposed Depth

Depth in Metres	FORMATION	Sample Number	Sample Interval	ASSAY VALUES %Gyp	%Anhy	%NaCl
0-18.90	Overburden.					
18.90-28.35	Solution cavity-blocks of light brown limestone and	R-1000		93.94	1.90	.005
	white, nodular mosaic gypsum with red clay infilling.					
28.35-54.86	Siltstone, medium to dark reddish brown with light grey					
	green mottling, variably sandy and shaly and very minor					
	conglomeratic interbed, laminae 80° to core axis, 53.34-					
	53.80 m fractured filled with orange selenite.					
	Contact erosional.					
54.86-55.90	Gypsum, light grey to orange, selenitic with dolomitic	R-1001	54.86-55.68	94.70	1.74	0.023
	laminae at base. Contact is gradational.					
55.90-63.09	Anhydrite, light blue, massive with very minor inter-	R-1002	56.08-56.39	7.74	82.94	0.023
	stitial dolomite and gypsum rosettes. Contact	R-1003	62.79-63.09	6.12	73.38	0.026
	erosional.					
63.09-63.67	Limestone, light brown with grey limestone inter-					
	laminae 85° to core axis. Contact gradational.					
63.67-66.35	Anhydrite, light blue as above. Contact erosional.	R-1004	66.14-66.45	7.26	89.99	0.020
66.35-66.54	Limestone, light brown, medium grained, laminae 85° to					
	core axis, sandy at base. Contact gradational.					
66.54-84.43	Sandstone, light grey at top to medium-dark reddish					

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DIAMOND DRILL RECORD

PROPERTY: **Meadows Road** HOLE NO. MR-86-3

Latitude	Departure	Elevation	Section From: 84.43 m To: 84.43 m

Datum	Bearing	Dip 90°	Started (date) August 1, 1986	Completed (date) August 12, 1986	Ultimate Depth 84.43 m	Proposed Depth

Depth in Metres	FORMATION	Sample Number	Sample Interval	ASSAY VALUES %Gyp	%Anhy	%NaCl
	brown at bottom, conglomeratic throughout, laminae 80°					
	to core axis. Satin spar filled fractures more abundant					
	toward base.					
	End of Hole.					

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NOVA SCOTIA DEPARTMENT OF MINES AND ENERGY
DIAMOND DRILL RECORD

PROPERTY: **Meadows Road** HOLE NO. MR-86-4

Latitude	Departure	Elevation	Section
46 Deg. 1 Min. 4.94 Sec.	60 Deg. 16 Min. 22.66 Sec.	48.026 m	From: 0 m To: 45.54 m

Datum	Bearing	Dip 90°	Started (date) August 13, 1986	Completed (date) August 18, 1986	Ultimate Depth 90.53 m	Proposed Depth

Depth in Metres	FORMATION	Sample Number	Sample Interval	ASSAY VALUES %Gyp	%Anhy	%NaCl
0-17.37	Overburden.					
17.37-29.35	Limestone, light brown - light grey, rubbly with much					
	core missing, some clay infilling, algal structures					
	near base. Contact is erosional.					
29.35-34.44	Gypsum, white, massive mosaic to nodular mosaic with	R-1024	29.41-29.69	98.24	2.31	0.006
	minor interstitial dolomite, vague dolomitic laminae at	R-1025	31.84-32.10	97.19	2.69	0.007
	base, minor selenite in mid unit, grades +90%. Contact	R-1026	33.91-34.21	92.55	2.32	0.008
	erosional.					
34.44-37.61	Siltstone, light grey green at top to dark reddish brown					
	at base, abundant satin spar filled fractures through-					
	out, minor calcite along fractures. Contact erosional.					
37.61-45.54	Anhydrite, light blue, 25% gypsum, most at top and base	R-1020	37.64-37.90	98.43	0.13	0.013
	with some rosettes throughout, minor interstitial	R-1021	40.84-41.10	5.73	90.87	0.016
	dolomite. Sandy at base.	R-1022	43.42-43.71	3.92	72.14	0.024
		R-1023	45.11-45.31	5.07	92.34	0.015
45.54-68.46	Sandstone, medium reddish brown except at top where					
	light grey, several fining upwards cycles, minor satin					
	spar filled fractures, silty in mid unit and at base.					
	Contact gradational.					
68.46-72.09	Siltstone, dark reddish brown mottled green, abundant					

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DIAMOND DRILL RECORD

PROPERTY: **Meadows Road** HOLE NO. MR-86-4

Latitude	Departure	Elevation	Section From: 80.19 m	To: 90.53
Datum	Bearing	Dip 90°	Started (date) August 13, 1986	Completed (date) August 18, 1986
Ultimate Depth 90.53 m	Proposed Depth			

Depth in Metres	FORMATION	Sample Number	Sample Interval	ASSAY VALUES %Gyp	%Anhy	%NaCl
	satin spar filled fractures and selenite filled vugs.					
	Contact erosional.					
72.09-80.19	Anhydrite, light blue, massive hydrated zone 9 cm	R-1027	72.24-72.52	20.64	73.73	0.017
	thick at top, minor siltstone interbeds near top.	R-1028	75.36-75.64	5.73	89.36	0.012
	Contact erosional.	R-1029	78.84-79.15	4.97	90.90	0.011
80.19-80.77	Limestone, light grey, broken at top, minor dark grey					
	siltstone interlaminae 80° to core axis. Contact					
	gradational.					
80.77-83.36	Anhydrite as above.	R-1030	80.76-81.08	4.30	65.67	0.035
83.36-83.67	Limestone, light olive grey, silty at top, sandy at	R-1031	82.98-83.21	3.54	88.26	0.012
	base, minor algal material laminae 80° to core axis.					
	Contract gradational.					
83.67-90.53	Sandstone, grey green at top, variably silty,					
	conglomeratic, calcareous, polymictic orthoconglomerate					
	with granitic and metamorphic clasts.					
	End of Hole.					

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Signature _____ Geologist

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DIAMOND DRILL RECORD

Sheet 1 of 1

PROPERTY: **Meadows Road**

HOLE NO. MR-86-5

Latitude	Departure	Elevation	Section
46 Deg. 1 Min. 26.64 Sec.	60 Deg. 17 Min. 47.23 Sec.	16.486 m	From: 0 m To: 38.71 m

Datum	Bearing	Dip 90°	Started (date)	Completed (date)	Ultimate Depth	Proposed Depth
			August 22, 1986	August 22, 1986	38.71 m	

Depth in Metres	FORMATION	Sample Number	Sample Interval	ASSAY VALUES %Gyp	%Anhy	%NaCl
0-38.71	Overburden and clay filled karst topography abandoned hole.					

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Signature Gordon C. Adams
Geologist

NOVA SCOTIA DEPARTMENT OF MINES AND ENERGY
DIAMOND DRILL RECORD

Sheet 1 of 1

PROPERTY: **Meadows Road**

HOLE NO. MR-86-6

Latitude	Departure	Elevation	Section
46 Deg. 1 Min. 31.79 Sec.	60 Deg. 17 Min. 46.83 Sec.	16.196 m	From: 0 m To: 44.81 m

Datum	Bearing	Dip 90°	Started (date)	Completed (date)	Ultimate Depth	Proposed Depth
			August 25, 1986	August 27, 1986	44.81 m	

Depth in Metres	FORMATION	Sample Number	Sample Interval	ASSAY VALUES %Gyp	%Anhy	%NaCl
0-44.81	Overburden and solution cavity. Abandoned hole.					

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DIAMOND DRILL RECORD

PROPERTY: **Meadows Road** HOLE NO. MR-86-7

Latitude	Departure	Elevation	Section
46 Deg. 1 Min. 47.59 Sec.	60 Deg. 20 Min. 11.52 Sec.	4.806	From: 0 m To: 17.22 m

Datum	Bearing	Dip	Started (date)	Completed (date)	Ultimate Depth	Proposed Depth
			August 28, 1986	September 5, 1986	84.43 m	

Depth in Metres	FORMATION	Sample Number	Sample Interval	ASSAY VALUES %Gyp	%Anhy	%NaCl
0-15.70	Overburden.					
15.70-16.00	Gypsum, light grey to white nodular to nodular mosaic,	R-1032	15.83-16.11	76.88	1.42	0.003
	abundant interstitial dolomite, laminae oriented					
	parallel to core axis and minor interlaminae of					
	siltstone 85°to core axis. Contact erosional.					
16.00-16.37	Gypsum, light grey interlaminated gypsum and limestone-					
	dolomite with abundant gypsum nodules.Contact erosional.					
16.37-16.52	Gypsum, as above with laminae parallel to core axis.					
	Contact erosional.					
16.52-16.61	Gypsum, light grey, nodular mosaic with common inter-					
	stitial dolomite and limestone dolomite laminae at base.					
	Contact erosional.					
16.61-16.82	Gypsum, light grey, with vague dolomitic interlaminae					
	80°-85° to core axis, minor selenite rosettes. Contact					
	erosional.					
16.82-16.95	Gypsum, white to light grey, nodular mosaic with minor					
	interstitial dolomite and dolomite laminae. Contact					
	erosional.					
16.95-17.22	Gypsum, light grey, vague dolomitic interlaminae 80°					

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DIAMOND DRILL RECORD

PROPERTY: **Meadows Road** HOLE NO. MR-86-7

Latitude	Departure	Elevation	Section From: 17.22 m To: 19.72 m
Datum	Bearing / Dip	Started (date) August 28, 1986	Completed (date) September 5, 1986 / Ultimate Depth 84.43 m / Proposed Depth

Depth in Metres	FORMATION	Sample Number	Sample Interval	ASSAY VALUES %Gyp	%Anhy	%NaCl
	to 85° to core axis. Contact erosional.					
17.22-17.37	Gypsum, white, nodular mosaic with abundant inter-					
	stitial dolomite, minor limestone interbed near top of					
	unit. Contact erosional.					
17.37-17.65	Gypsum, light grey, vague dolomitic interlaminae.					
	Contact gradational.					
17.65-18.23	Gypsum, white nodular mosaic with minor to abundant					
	interstitial dolomite, medium grained. Contact					
	erosional.					
18.23-18.90	Gypsum, white interlaminae as above. Contact erosional	R-1033	18.59-18.95	92.79	2.57	0.005
18.90-19.03	Gypsum, white nodular mosaic. Contact erosional.					
19.03-19.07	Limestone, medium to dark grey, fine grained, moderately					
	calcareous. Contact erosional.					
19.07-19.17	Gypsum, light grey, vague laminae of dolomite, minor					
	selenite crystals. Contact erosional.					
19.17-19.25	Limestone, as above. Contact erosional.					
19.25-19.66	Gypsum, white nodular mosaic with minor interstitial					
	dolomite. Contact erosional.					
19.66-19.72	Limestone, medium grey, abundant satin spar filled					

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DIAMOND DRILL RECORD

PROPERTY: **Meadows Road** HOLE NO. MR-86-7

Latitude	Departure	Elevation	Section From: 19.72 m	To: 40.58 m
Datum	Bearing	Dip	Started (date) August 28, 1986	Completed (date) September 5, 1986	Ultimate Depth 84.43 m	Proposed Depth

Depth in Metres	FORMATION	Sample Number	Sample Interval	ASSAY VALUES %Gyp	%Anhy	%NaCl
	fractures. Contact erosional.					
19.72-20.76	Gypsum, white, nodular mosaic, minor interstitial					
	dolomite, minor selenite crystals near top and base.					
	Contact erosional.					
20.76-20.77	Limestone, medium to dark grey, massive, medium to fine					
	grained. Contact ?.					
20.77-22.86	Gypsum, white to light grey, nodular mosaic with minor	R-1034	21.93-22.15	94.80	2.48	0.006
	interstitial dolomite, numerous small voids near base,					
	anhydrite at base. Contact gradational.					
22.86-39.72	Anhdydrite, light blue, nodular mosaic at top with minor	R-1035	24.77-25.02	3.01	91.17	0.039
	interstitial dolomite, rest is massive, minor gypsum-	R-1036	27.83-28.04	2.34	96.75	0.020
	filled fractures mostly perpendicular to core axis,	R-1037	30.65-30.94	4.35	95.20	0.129
	minor gypsum rosettes. Contact erosional.	R-1038	33.68-33.96	2.53	97.66	0.015
39.72-39.81	Limestone, medium to dark grey, massive as above.	R-1039	36.58-36.88	1.82	97.65	0.017
	Contact erosional.	R-1040	39.52-39.80	2.63	90.12	0.059
39.81-40.51	Anhydrite, light blue, massive with minor gypsum					
	rosettes. Contact erosional.					
40.51-40.58	Limestone, medium to dark grey, fine grained, dense,					
	moderately calcareous, dolomitic in part. Contact					

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NOVA SCOTIA DEPARTMENT OF MINES AND ENERGY
DIAMOND DRILL RECORD

PROPERTY: **Meadows Road** HOLE NO. MR-86-7

Latitude	Departure	Elevation	Section From: 40.58 m	To: 44.53 m
Datum	Bearing	Dip	Started (date) August 28, 1986	Completed (date) September 5, 1986	Ultimate Depth 84.43 m	Proposed Depth

Depth in Metres	FORMATION	Sample Number	Sample Interval	ASSAY VALUES %Gyp	%Anhy	%NaCl
	erosional.					
40.58-40.81	Anhydrite, light blue, as above. Contact erosional.					
40.81-40.87	Limestone-dolomite medium to dark grey, medium grained,					
	calcareous at top and bottom, vertical gypsum filled					
	fractures. Contact erosional.					
40.87-40.93	Anhydrite, light blue as above. Contact erosional.					
40.93-41.00	Limestone-dolomite, as above. Contact erosional.					
41.00-41.94	Anhydrite, light blue, minor interstitial limestone,					
	common gypsum rosettes in lower 1/2 of unit. Contact					
	erosional.					
41.94-41.96	Dolomite, dark grey as above. Contact erosional.					
41.96-42.37	Anhydrite, light blue, massive with minor gypsum	R-1041	42.37-42.62	7.17	85.32	0.067
	rosettes. Contact erosional.					
42.37-42.40	Dolomite, dark grey as above. Contact erosional.					
42.40-44.50	Anhydrite, light blue grey, massive at top to nodular	R-1042	44.35-44.60	63.26	2.05	0.014
	mosaic and nodular below, minor to abundant interstitial					
	limestone, abundant selenite throughout. Contact					
	erosional.					
44.50-44.53	Dolomite, dark grey, fine grained, massive as above.					

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DIAMOND DRILL RECORD

PROPERTY: **Meadows Road** HOLE NO. MR-86-7

Latitude	Departure	Elevation	Section From: 44.53 m To: 49.74 m
Datum	Bearing / Dip	Started (date) August 28, 1986	Completed (date) September 5, 1986 / Ultimate Depth 84.43 m / Proposed Depth

Depth in Metres	FORMATION	Sample Number	Sample Interval	ASSAY VALUES %Gyp	%Anhy	%NaCl
	Contact erosional.					
44.53-47.66	Limestone, light grey to light brownish grey, algal in					
	part, variably fossiliferous with crinoidal material,					
	minor anhydrite at top and gypsum filled fractures					
	throughout. Contact erosional.					
47.66-48.13	Gypsum, white, saccharoidal varying amounts of inter-					
	stitial dolomite and limestone most common at top and					
	base of unit. Contact erosional.					
48.13-48.52	Mudstone, medium to dark grey, silty in part with silty					
	laminae 75°-80° to core axis, minor satin spar filled					
	fractures throughout 60°-90° to core axis.					
	Contact ?.					
48.52-48.65	Anhydrite breccia, light blue subrounded anhydrite					
	clasts in medium grey mudstone matrix, gypsum at base.					
	Contact erosional.					
48.65-49.15	Mudstone, medium grey mottled dark red, gypsum filled					
	fractures at top. Contact gradational.					
49.15-49.29	Anhydrite, breccia as above. Contact gradational.					
49.29-49.74	Mudstone, dark red massive, slightly silty with gypsum					

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DIAMOND DRILL RECORD

PROPERTY: **Meadows Road** HOLE NO. MR-86-7

Latitude	Departure	Elevation	Section From: 49.74 m To: 79.61 m
Datum	Bearing / Dip	Started (date) August 28, 1986	Completed (date) September 5, 1986 / Ultimate Depth 84.43 m / Proposed Depth

Depth in Metres	FORMATION	Sample Number	Sample Interval	ASSAY VALUES %Gyp	%Anhy	%NaCl
	and salt filled fractures. Contact erosional.					
49.74-49.80	Anhydrite, light blue, massive nodules in red mudstone					
	matrix. Contact gradational.					
49.80-51.45	Mudstone-siltstone, dark reddish brown, minor sandy					
	interval in mid unit, gypsum filled fractures through-					
	out. Contact gradational.					
51.45-52.00	Anhydrite breccia, as above. Contact erosional.					
52.00-53.95	Mudstone, dark red mottled grey green at base, variably					
	silty, silty at base, gypsum filled fractures					
	throughout. Contact gradational.					
53.95-54.74	Interlaminated mudstone, dolomite and anhydrite, medium					
	to dark grey 80°-85° to core axis. Contact					
	gradational.					
54.74-55.78	Mudstone, dark reddish brown with grey green mottling					
	and interlaminae. Contact gradational.					
55.78-56.27	Anhydrite breccia, as above, more anhydrite towards base					
	Contact gradational.					
56.27-79.61	Anhydrite, light blue, massive to nodular downwards with	R-1043	56.66-56.92	4.92	69.24	0.162
	increasing interstitial mudstone minor dark grey	R-1044	59.74-60.05	32.40	65.26	0.071

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DIAMOND DRILL RECORD

PROPERTY: **Meadows Road** HOLE NO. MR-86-7

Latitude	Departure	Elevation	Section From: 79.61 m To: 84.43 m

Datum	Bearing	Dip	Started (date) August 28, 1986	Completed (date) September 5, 1986	Ultimate Depth 84.43 m	Proposed Depth

Depth in Metres	FORMATION	Sample Number	Sample Interval	ASSAY VALUES %Gyp	%Anhy	%NaCl
	mudstone interbeds near base. Contact erosional.	R-1045	62.74-63.09	3.78	94.28	0.019
79.61-84.43	Shale, dark grey, varies to limestone-dolomite in part,	R-1046	65.70-65.99	2.53	97.32	0.015
	slightly petroliferous, minor fossils.	R-1047	68.66-68.99	2.92	96.89	0.021
	End of Hole.	R-1048	71.63-71.91	4.30	94.59	0.065
		R-1049	74.60-74.85	5.73	87.85	0.047
		R-1050	77.56-77.82	7.74	74.37	0.284
		R-1051	79.71-79.96	7.65	47.07	0.119

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NOVA SCOTIA DEPARTMENT OF MINES AND ENERGY
DIAMOND DRILL RECORD

PROPERTY: **Meadows Road** HOLE NO. MR-86-8

Latitude	Departure	Elevation	Section
46 Deg. 1 Min. 15.95 Sec.	60 Deg. 18 Min. 33.78 Sec.	23.956 cm	From: 0 m To: 41.76 m

Datum	Bearing	Dip	Started (date)	Completed (date)	Ultimate Depth	Proposed Depth
		90°	September 8, 1986	September 11, 1986	67.36 m	

Depth in Metres	FORMATION	Sample Number	Sample Interval	ASSAY VALUES %Gyp	%Anhy	%NaCl
0-10.06	Overburden.					
10.06-11.28	Limestone, dark grey, highly calcareous, medium grained,					
	scoriacious in part, minor laminae 50° to core axis,					
	cavity at base at contact with gypsum.					
11.28-23.47	Gypsum, white, massive to nodular mosaic, much more	R-1055	14.33-14.58	98.95	0.89	0.003
	missing at top and bottom, probably solution cavities.	R-1056	19.91-20.19	93.41	0.70	0.005
	Contact missing.					
23.47-26.52	Siltstone, dark reddish brown, minor sandy material,					
	minor calcite filled fractures, slightly calcareous in					
	mid unit, 0.46 m core missing.					
26.52-32.61	Siltstone, dark reddish brown, calcareous only 1.7 m					
	core, variably sandy increasing towards base.					
	Contact ?.					
32.61-38.40	Mudstone breccia, dark reddish brown poorly					
	consolidated, calcareous, possible solution cavity					
	infilling. Contact ?.					
38.40-41.76	Gypsum, white massive to nodular, only 2.13 m core	R-1057	38.48-38.71	95.75	2.06	0.004
	recovered, probably cavity at base, minor to common	R-1058	41.32-41.63	91.55	2.58	0.007
	interstitial calcareous mudstone. Contact ?.					

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Signature Gordon C. Adams, Geologist

NOVA SCOTIA DEPARTMENT OF MINES AND ENERGY
DIAMOND DRILL RECORD

PROPERTY: **Meadows Road** HOLE NO. MR-86-8

Latitude	Departure	Elevation	Section From: 41.76 To: 67.36
Datum	Bearing	Dip 90°	Started (date) September 8, 1986 / Completed (date) September 11, 1986 / Ultimate Depth 67.36 m / Proposed Depth

Depth in Metres	FORMATION	Sample Number	Sample Interval	ASSAY VALUES %Gyp	%Anhy	%NaCl
41.76-57.00	Cavity, only 0.91 m core recovered, minor limestone and					
	sandy siltstone recovered.					
57.00-61.72	Siltstone, dark reddish brown, sandy to conglomeratic					
	in part with poorly sorted polymictic clasts (quartz,					
	red and green siltstone and metamorphics), highly					
	calcareous throughout. Only 1.2 m core recovered in top					
	3.0 m of unit. Cavity at base.					
61.72-66.32	Siltstone, dark reddish brown, sandy, scoriacious, minor					
	conglomeratic interbed in mid unit, shaly towards base.					
	Contact gradational.					
66.32-67.36	Siltstone and shale, interlaminated, dark reddish brown					
	with minor grey mottling, laminae 80° to 85° to core					
	axis.					
	End of Hole.					

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